

MDEQ/Remediation Division  
 Comments/Concerns/Questions/ 2016 Rose & Westsra Report  
 Dr. Rick Rediske, Annis Water Resource Institute

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Having reviewed the 2016 Rose and Westra (R&W) report, have found a number of concerns as summarized by Dr. Rediske below:

1. **Page 4.** R&W purports to have conducted an evaluation that determined the extent of the coldwater fishery designation yet provides no temperature data to support their conclusion. As shown in Table 2 of their report, coldwater fish are 10x more sensitive to ammonia than warm water fish. The attached MDEQ report, based on actual data, shows that the Rockford Dam does not alter the cold water character of the stream. The downstream site in the MDEQ report (which is primarily overflow from the dam) has an annual mean temperature of 10-11°C. The grand mean temperature for July 2009 and 2011 was 19.1°C. There is no evidence of the warm backwater described in the R&W report. R&W's assumption of warm water conditions was used to justify their unionized ammonia calculations on page 10 and Table 7. This is not supported by data in their report and it is contradicted by MDEQ data.
2. **Page 6.** R&W refer to a manometer with "estimated" sensitivity. No information was provided on the type of manometer used or how sensitivity was determined. No information was provided to assess the precision and accuracy of their manometer measurements. Only a single pore water duplicate sample was collected out of ~70 measurements and the manometer pressure was not recorded. A credible survey would contain documentation of field precision. A review of methods to determine groundwater flows (<http://www.hydrol-earth-syst-sci.net/10/873/2006/hess-10-873-2006.pdf>) found seepage meters to have better resolution for spatial scale determinations, as would be necessary to characterize a large area of stream bed. Manometers have much less spatial resolution.
3. **Page 8.** R&W used an infrared camera to look for preferential discharge areas and found none. This is not surprising as temperature surveys used to determine groundwater flow should be done at times where there is the greatest temperature differential between surface and groundwater. Summer and winter are the optimum times to do this type survey ([http://www.nj.gov/dep/srp/guidance/srra/gw\\_discharge\\_to\\_sw\\_tech\\_guidance.pdf](http://www.nj.gov/dep/srp/guidance/srra/gw_discharge_to_sw_tech_guidance.pdf)). An analysis of the Rockford weather station showed that the monthly mean temperature for 30 days prior Dec 15 2015 was 41°F. This cannot be classified as winter temperatures for Michigan. In addition, groundwater seepage rates are highly temporal and even diel variable ([https://ndep.nv.gov/bwqp/file/Carson\\_Thermal\\_TG\\_15Dec11\\_Final.pdf](https://ndep.nv.gov/bwqp/file/Carson_Thermal_TG_15Dec11_Final.pdf)). A single survey over a few days in December cannot be used to estimate the impact of an ammonia discharge during the summer season of low flow and higher temperature and pH. With only a single December data point, R&W provides no evidence that shows their projected and adjusted results are representative of actual summer conditions.
4. **Page 9.** The method used by R&W to characterize benthic life is not credible. Michigan has a long history of using P-51 methods (<http://www.michigandnr.com/publications/pdfs/IFR/manual/SMII%20Chapter25A.pdf>) for benthic surveys. R&W needs to provide data that their "visual" method with no literature or agency reference is capable of providing comparable data. Benthic invertebrates are in contact with the seepage water and

community status needs to be assessed by a credible method to determine if there is an impact to aquatic life.

**5. Page 11.** R&W used an unknown method to adjust all their pH titration data because of a difference between field and lab measurements. Carbonate equilibrium is complex and the excess CO<sub>2</sub> in groundwater quickly is neutralized by carbonate rich surface water. R&W needs to provide the stoichiometric chemical calculations used to “adjust” the data and describe how their methods account for carbonate equilibrium chemistry. In addition, the pressure difference between surface water and pore water only was 0.2-0.5” of water (Table 5). This small difference in pressure does not support the R&W hypothesis that there was sufficient CO<sub>2</sub> pressure present to cause a significant pH change by off-gassing.

**6. Page 11.** Conclusion 1 is invalid as described in #3. Conclusions 2-4 are invalid based on the unknown pH adjustment method and the incorrect assessment of warm water temperatures. Their request for Mixing Zone GSI Criteria should be denied based on questionable assumptions and data adjustments in addition to the obvious problems associated with using what appears to be a very unrepresentative fall sample to characterize critical summer conditions.